DR-35

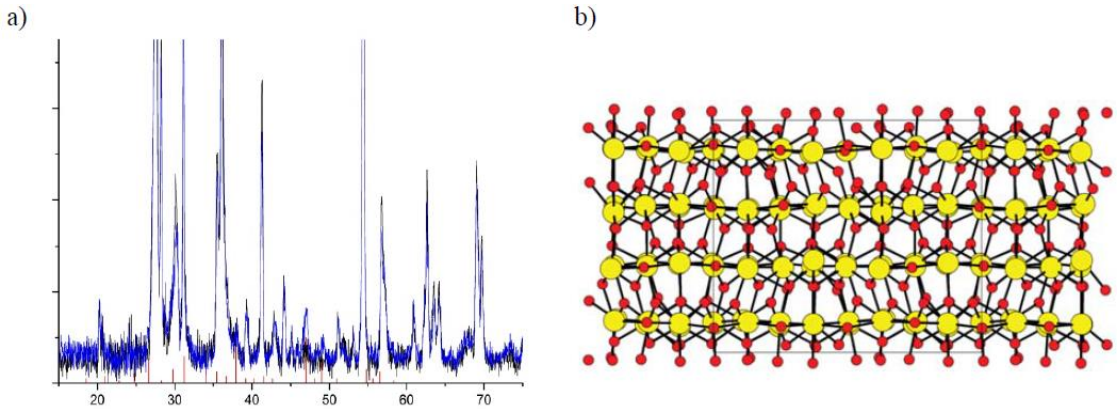
SYNTHESIS OF ROXBYITE $Cu_{58}S_{32}$ THIN SOLID FILMS

N. S. Kozhevnikova,[1,2] L. N. Maskaeva,[1] V. F. Markov,[1] A. Yu. Chufarov[2]

[1] Ural Federal University of the first President of Russia B. N. Yeltsin.
19 Mira St., Yekaterinburg, 620002, Russia.
[2]Institute of Solid State Chemistry, UB RAS, 91 Pervomayskaya St.,
Yekaterinburg, 620990, Russia.
E-mail: kozhevnikova@ihim.uran.ru

Abstract. For several decades, considerable scientific attention has been given to the synthesis of nontoxic and commercially viable semiconductor materials that possess excellent functional properties for use in important and evolving technologies. The copper sulfides is a class of materials that has been receiving a high level of interest in recent years.[1] In the copper–sulfur system, there are a number of Cu_xS (x = 1–2) compounds. In the copper-rich section, all the stable compounds of Cu_xS are p-type semiconductor because of the copper vacancies within the lattice. As a p-type semiconductor with small band gap and high ionic conduction, Cu_xS compounds are expected to be distinguished candidates for photovoltaics, field emission devices and lithium-ion batteries.[2]

In this abstract, copper sulfide thin solid films with roxbyite crystal sructure were synthesized for the first time via one-pot strategy based on chemical bath deposition from aqueous solutions of copper and sulfide sources. The structure of roxbyite is based on a hexagonal-close-packed framework of sulfur atoms with the copper atoms occupying these layers, all having triangular coordination. Other layers sandwiched between the close-packed sulfur layers consist purely of double, or split, layers of Cu atoms[3] (Fig. 1).



Fugure 1. The experimental X-ray diffraction pattern of $Cu_{58}S_{32}$ film synthesized from aqueous solution (a) and distribution of atoms in roxbyite viewed along the **b** axis[3] (b)

References

1. Regulacio M. D. Facile solvothermal approach to pristine tetrahedrite nanostructures with unique multiply-voided morphology / M. D. Regulacio, S. Y. Tee, S. H. Lim, C. P. Teng, L.-D. Koh, S. Liu, M.Y. Han // Nanoscale. – 2017. – Vol. 9, Iss. 12. – 17865–17876.
2. Song C. Controlled synthesis of novel rod-like $Cu_{1.81}S$ nanostructures and field emission properties / C. Song, K. Yu, S. Li, H. Yin, N. Zhang, B. Zhao, Z. Zhu // Applied Surface Science. – 2014. – Vol. 315. – 235–240.
3. Mumme W.G. The crystal structure of roxbyite, $Cu_{58}S_{32}$ / W. G. Mumme, R. W. Gable, V. Petříček. // The Canadian Mineralogist. – 2012. – Vol. 50. – 423–430.

This work was supported by the Government of the Russian Federation (program 211, project # 02.A03.21.0006) and by the state assignment for the Institute of Solid State Chemistry UB RAS.